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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003906460 for a patent by JOHN WHITEHEAD as filed on 24 November 2003.

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J. Billingsley

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TEAM LEADER EXAMINATION
SUPPORT AND SALES

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Patents Act 1990

P/00/009
Regulation 3.2

Revised 2/98

Provisional Specification

Invention Title

TWIN CHUCK DRILL WITH ONE DRIVE SHAFT

The invention is described in the following statement

(See within)

THIS INVENTION relates to a pistol-grip tool having two chucks that are interchangeable in position, and is more specifically concerned with such a tool capable of being controlled by one hand of a user so that his other hand is freed for some other purpose.

The use of a tool such as an electric drill, at an overhead position presents special problems. When drilling a hole it is often necessary to first form a pilot hole and then enlarge it with a second drill of larger diameter. If the user is standing on a ladder to form the pilot hole, it is necessary for him to descend the ladder if using a single chuck drill, and then replace the drill bit with one of larger size. The user must then ascend the ladder once again to find the pilot hole to be enlarged. If the pilot hole is not sufficiently deep for the larger drill, the whole process must be repeated.

The need for a tool having two chucks that are interchangeable in position has long been recognized and is the subject of a number of patented proposals. However these proposals have either resulted in a tool that is impracticable to use or which does not allow the user to interchange the positions of the chucks without using both hands. Thus the advantage of having one hand free for some other purpose, such as to hold a ladder the user may be standing on, is lost.

An object of this invention is to provide an improved two-chuck drill.

In accordance with the present invention a pistol-grip tool has first and second chucks one of which may be replaced by the other at a common driving position; a rotary drive shaft providing drive to whichever of the chucks is at the common driving position; a releasable device such as a clutch operable to disconnect the rotary drive shaft from the chuck at the driving position when the chucks are to be interchanged; a chuck-changing unit operable with drive obtained from the drill motor after the device has been released, to re-position the chuck formerly in use to one side of the common driving position and then to turn it about the drive shaft axis to occupy a position in front of the pistol-grip, the unit also . . bringing the

second chuck from a position in front of the pistol-grip to the common driving position; and, a mechanism operable by the same hand of the tool user as is holding the pistol-grip, to initiate operation of the chuck-changing unit and the engagement and disengagement of the device so that the drive from the drive shaft is only imparted to the chuck at the driving position when the other chuck occupies a position in front of the pistol-grip of the tool. The device preferably comprises a clutch having teeth which engage one another when power is to be transmitted from the drive shaft to whichever of the chucks is at the common driving position.

An advantage of the tool of the invention is that the chuck is not in use always occupies a position in front of the pistol-grip where it has the lest chance of obstructing further operation of the tool. When it is required to interchange the positions the chucks this may be carried out, for example, by the user depressing a finger button alongside the pistol grip while the tool is not working. This can be arranged to initiate a control sequence that interchanges the positions of the chucks, and then restores the driving connection between the drive shaft and the chuck at the common driving position. Preferably, the tool cannot transmit power from the drive shaft to either of the chucks until the chuck-interchange sequence has been completed.

The invention will now be described in more detail, by way of example, with reference to the accompanying informal and largely diagrammatic drawings; in which:

FIGURES 1 to 1 are partially exploded and simplified views of parts of a front end-portion of a pistol-grip drill, taken from different directions and which show successive stages during change-over of two chucks, the figures showing positions occupied by the drill parts during two successive chuck change-over sequences.

In the figures, corresponding parts of the drill have the same reference numbers.

The drill front end shown generally at 1 includes the forward portion of a drill casing 2 containing an electric motor (not shown) controlled by a trigger switch 3 mounted on a pistol-grip 4 that is gripped by one hand of a user when the drill is in use.

The motor rotates a drill drive shaft 5 that can be reciprocated between two axially displaced positions by a mechanism (not shown) contained in a cylindrical box 6 surrounding the shaft 5. An arrow 7 shows the direction of rotation of the shaft 5.

The casing 2 has a forward extension 8 that can be rotated about the axis of the shaft 5 and also turned in the same plane as the shaft. The shaft 5 carries a crown gear 10 that reciprocates with the shaft and is rotated by it, the gear 10 being capable of meshing with a circular toothed track 12 extending around one side of a disc 13. The disc 13 is pivotally mounted on a spindle 14 extending between the extension 8 and a collar 15 through which the shaft 5 is a close sliding fit. Opposite ends of the track 12 are respectively provided with stops 16 and 17 that limit the angle to which the crown gear 10 can travel around the track 12 when the shaft 5 is rotated.

As explained above, the connection between the casing 2 and the extension 8 allows the extension 8 two freedoms of movement. One freedom of movement comprises a rotational movement of the extension 8 about the axis of the shaft 5, and the second freedom of movement allows the extension 8 to rotate through ninety degrees in the same plane as the drive shaft.

The casing 8 carries two rotatable drill drive chucks 20 and 21 that project at right angles to one another, as shown. The chuck 20 is shown in the driving position of the drill in figure 1 and is illustrated supporting a conventional removable drill bit 23. The other chuck 21 is illustrated supporting a counter-sinking bit 24 at a position at which it extends downwardly forwardly of the pistol-grip 4 of the drill.

In the position of the drive shaft 5 illustrated in figure 1, the crown gear 10 is positioned forwardly of the track 12 so that they are not in mesh. However, if the mechanism in the box 6 is operated, the shaft 5 is retracted to the right of figure 1 so

that the crown gear 10 is brought into mesh with the track 12. To establish a driving connection to the chuck in use, the forward end of the shaft 5 is of hexagonal cross-section and fits within a socket of complementary cross-section of whichever of the chucks 20, 21 is in the driving position at the left-hand end of the drive shaft.

The operation of the chuck-changing mechanism shown in the drawings will now be described.

With the parts of the drill in the positions shown in figure 1, the drill drives the drill bit 23. When a drill hole of the appropriate depth has been formed, it is desired to countersink it by bringing the chuck 21 and the countersinking bit 21 to the drive position. This is achieved by operating a finger button (not shown) positioned close to the trigger 3 so that the user of the drill can press the button with one finger of the same hand as is holding the pistol-grip.

The action of pressing the button is to energise a sequencing circuit that carries out the following steps. The drill drive motor is first temporarily immobilised and the mechanism in the box 6 is operated to withdraw the forward end-portion of the shaft 5 from the socket in the chuck 20. Simultaneously the crown gear 10 is meshed with the arcuate toothed rack 12. This is shown in figure 2. The user can then re-energise the driving motor so that the crown gear 10 is rotated to drive the disc 13 in a clockwise direction by way of the rack 12. The two chucks 20,21 are then displaced angularly so that the chuck 21 moves towards the driving position and the chuck 20 moves towards a vertically upward position. Successive stages in this movement are shown in figures 3 and 4. When the chuck 20 reaches the position shown in figure 4, the crown gear 10 abuts the stop 16 so that further rotation of the disc 13 about the axis of the spindle 14 is prevented. The first freedom of movement of the extension 8 is then complete.

As the crown gear 10 cannot rotate further along the track 12, further rotation of the drive shaft 5 causes the extension 8 and disc 13 to move through their second degree of freedom and rotate bodily around the axis of the drive shaft 5. This moves the

chuck 20 from the position shown in figure 4 through the successive positions shown in figures 5, 6 and 7 to the position shown in figure 8 at which the chuck 20 is positioned directly in front of the pistol-grip 4. During this rotation of the chuck 20 the second chuck 21 remains in the driving position of the drill as shown. Once the chuck 20 has reached the position shown in figures 8 and 9, a mechanical switch (not shown) is operated by the extension 8 to stop operation of the mechanism in the box 6 and the drill drive motor, and to allow advance of the front-end of the drive shaft 5 towards the front of the drill. The force to do this is provided by a resilient bias (not shown) that acts continuously on the drive shaft 5. This forward movement of the drive shaft 5 disengages the pinion 10 from the rack 12 as shown in figure 10, and the forward end of the drive shaft 5 then enters the socket in the back of the chuck 21 to establish a driving engagement between the drill motor drive shaft 5 and the chuck 21. On completion of this movement of the shaft 5, the forward movement of the drive shaft 5 operates a switch (not shown) to allow the operation of the trigger 3 to energise the drive motor once again and enable the countersinking bit in the chuck 21 to be used.

If it is again required to interchange the positions of the chucks 20 and 21, the above procedure is repeated. The mechanism in the box 6 is operated to withdraw the drill shaft 5 from the chuck 21 against the force of the resilient bias, and to temporarily immobilise the electrical circuit to prevent operation of the drill motor from the trigger 3. The withdrawal movement of the shaft 5 brings the crown gear 10 into mesh once again with the teeth of the arcuate rack 12 as shown in figure 11. The electrical circuit to the motor is then again energised so that the user can operate the trigger 3 to drive the shaft 5 in the same direction as previously, as is indicated by the arrow, to rotate the disc 13 in a counterclockwise direction, as shown in figure 11, about the axis of the spindle 14. This movement of the shaft 5 appears counterclockwise in figure 11 because the rack 12 on the disc 13 is now engaging the opposite side of the crown gear 10 to that shown engaged with the rack in earlier figures.

The counterclockwise movement of the disc 13 moves the chuck 21 upwardly and brings the chuck 20 into alignment with the drive shaft 5, as shown in figure 12. This movement is completed when the rack 12 has turned through ninety degrees and the crown gear 10 abuts the stop 17 at the end of the track 12. When this occurs, the turning movement of the shaft 5 is imparted to turn the disc 13 and extension 8 bodily about the axis of the shaft 5 so that the chuck 21 is rotated about the shaft 5 from a vertically upwards position, through the stages shown in figures 13, 14, 15 and 16, to the vertically downwards position shown in figure 17 when it is located a short distance in front of the pistol-grip 4. This movement is terminated by the actuation of a switch responsive to movement of the extension 8 to de-activate the mechanism in the box 6 and temporarily prevent the electric motor from being operated. The resilient bias on the shaft 5 is then able to move the shaft 5 axially in a forward direction to bring its free end-portion into engagement with the socket at the back of the chuck 20. Simultaneously the crown gear 10 is disengaged from the rack 12 and the parts of the drill assume the positions shown in figure 18. The finger-operated switch, which initiated the interchange of the two chucks 20 and 21, is then released automatically by the forward movement of the shaft 5 to allow the drill to be again operated by the trigger 3 so that the electric motor can again be energised to rotate the chuck 20 in the driving position.

From the above description it will be understood that I claim my invention to reside in one or more of the features set forth in the following numbered paragraphs:

1. A pistol-grip tool having first and second chucks one of which may be replaced by the other at a common driving position; a releasable device such as a clutch operable to disconnect the rotary drive shaft from the chuck at the driving position when the chucks are to be interchanged; a chuck-changing unit operable with drive obtained from the drill motor, after the device has been released, to re-position and then to turn it about the drive shaft axis to occupy a position in front of the pistol-grip, the unit also bringing the second chuck from a position in front of the pistol-grip to the common driving position; and a mechanism operable by the same hand of the tool user as is holding the pistol-grip, to initiate operation of the chuck-changing unit and the disengagement and re-engagement of the device so that the drive from the drive shaft is only imparted to the chuck at the driving position when the other chuck is occupying a position in front of the pistol-grip of the tool.

2. A tool as set forth in the above paragraph, including a finger button alongside the pistol-grip which can only operate the device when the drive shaft is not rotating.

3. A tool as set forth in either of the above paragraphs, having a part which carries the chucks and which has two degrees of freedom so that it is rotatable about the drive shaft and is also rotatable in the same plane as the drive shaft.

4. A tool as set forth in paragraph 3, in which said part carries a rotatable disc having a concentric toothed track and the device comprises a crown gear through which the drive shaft is slidable without relative rotation and which is displaceable into and out of mesh with the track by reciprocation of the drive shaft.

Dated: this 20th day of November 2003.

JOHN WHITEHEAD

By.....

Applicant's Patent Attorney

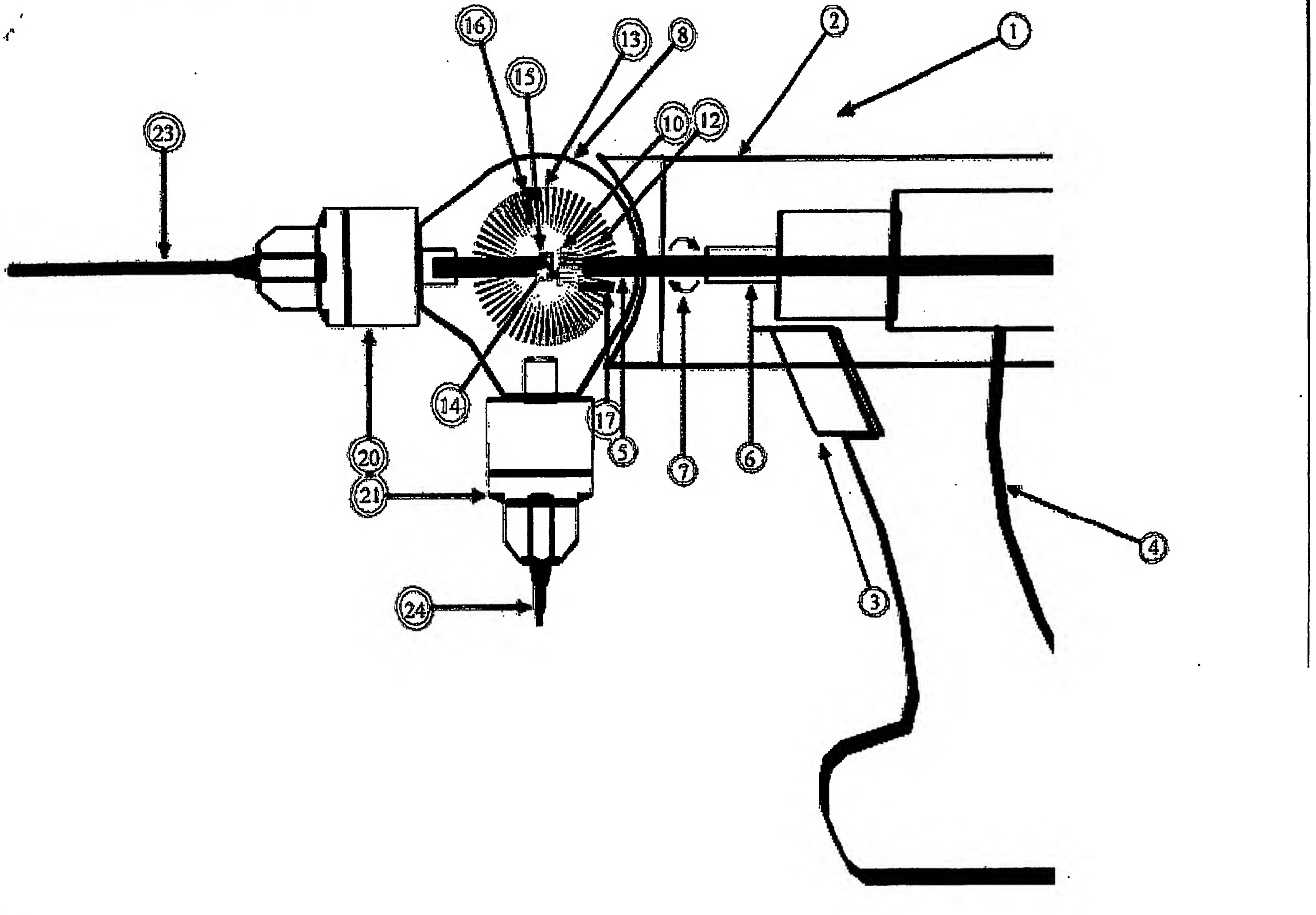
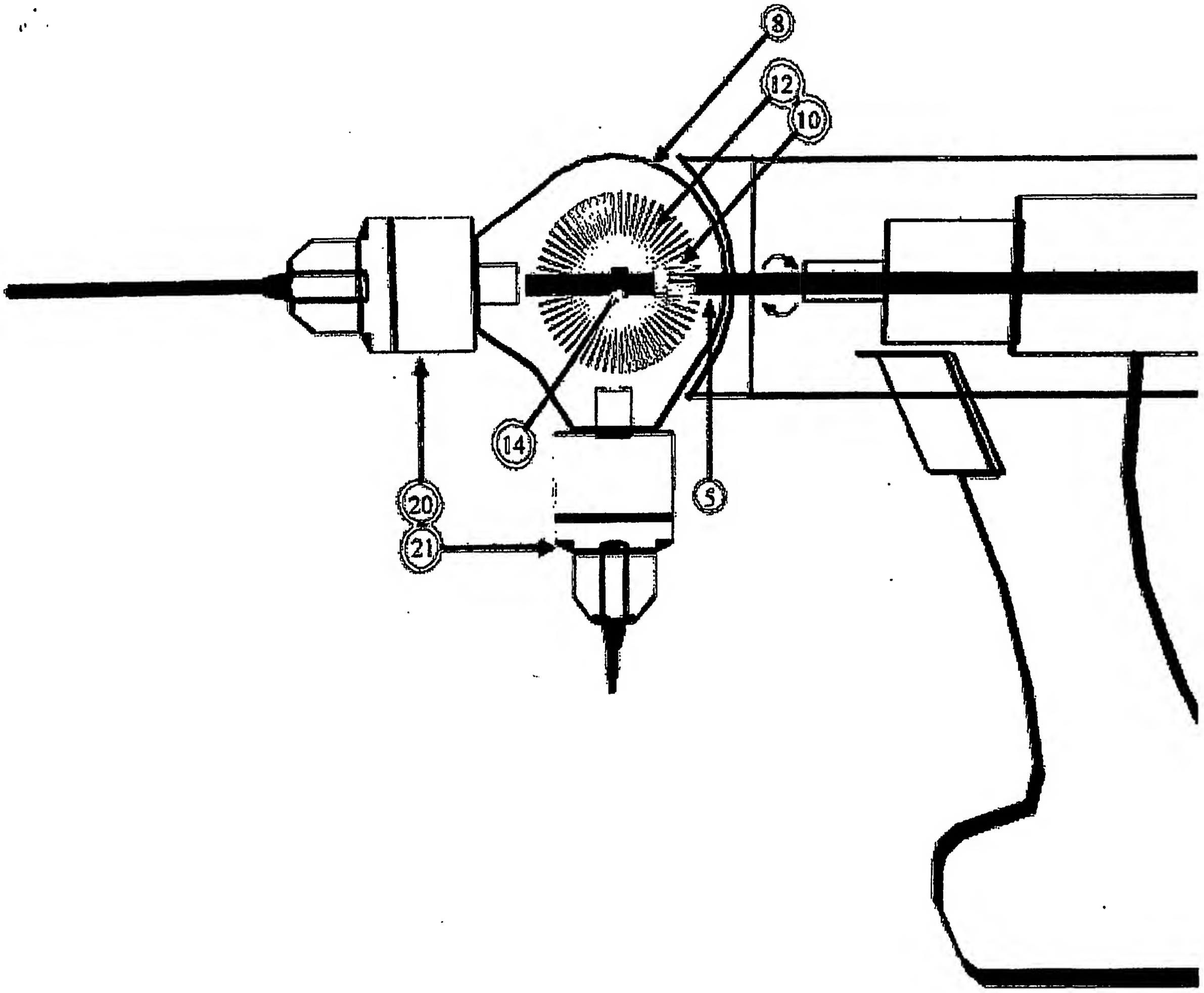


Figure 1



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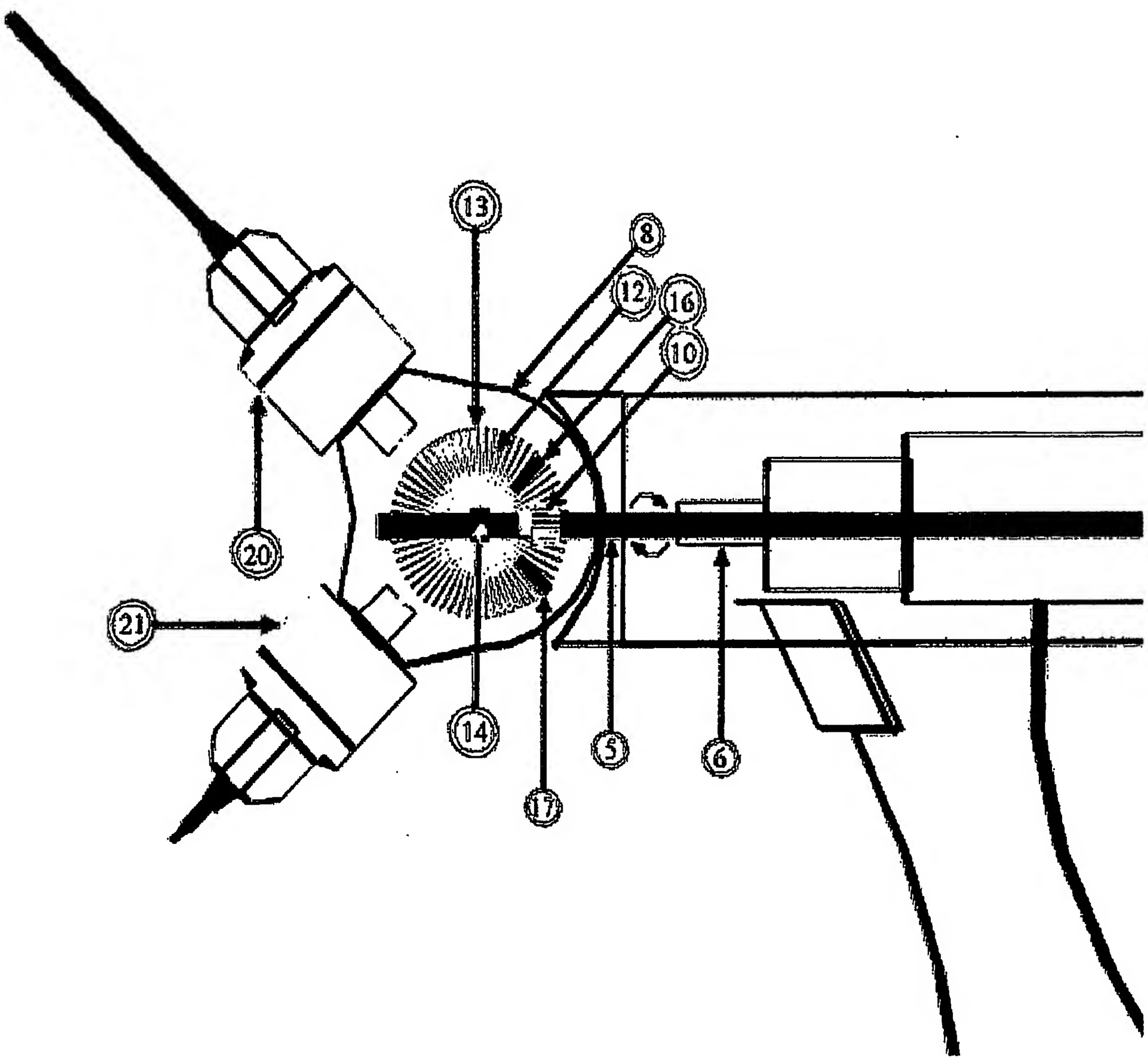

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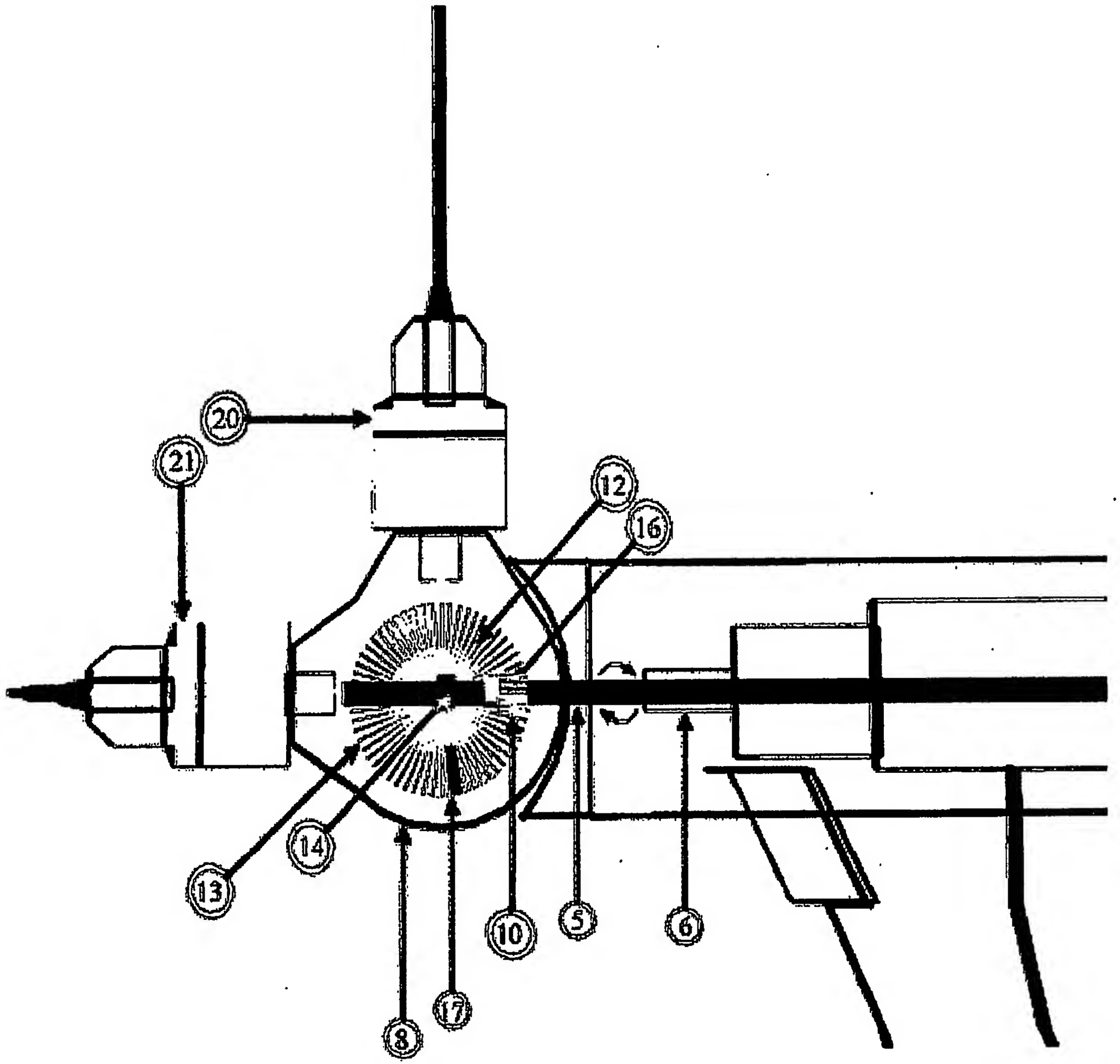

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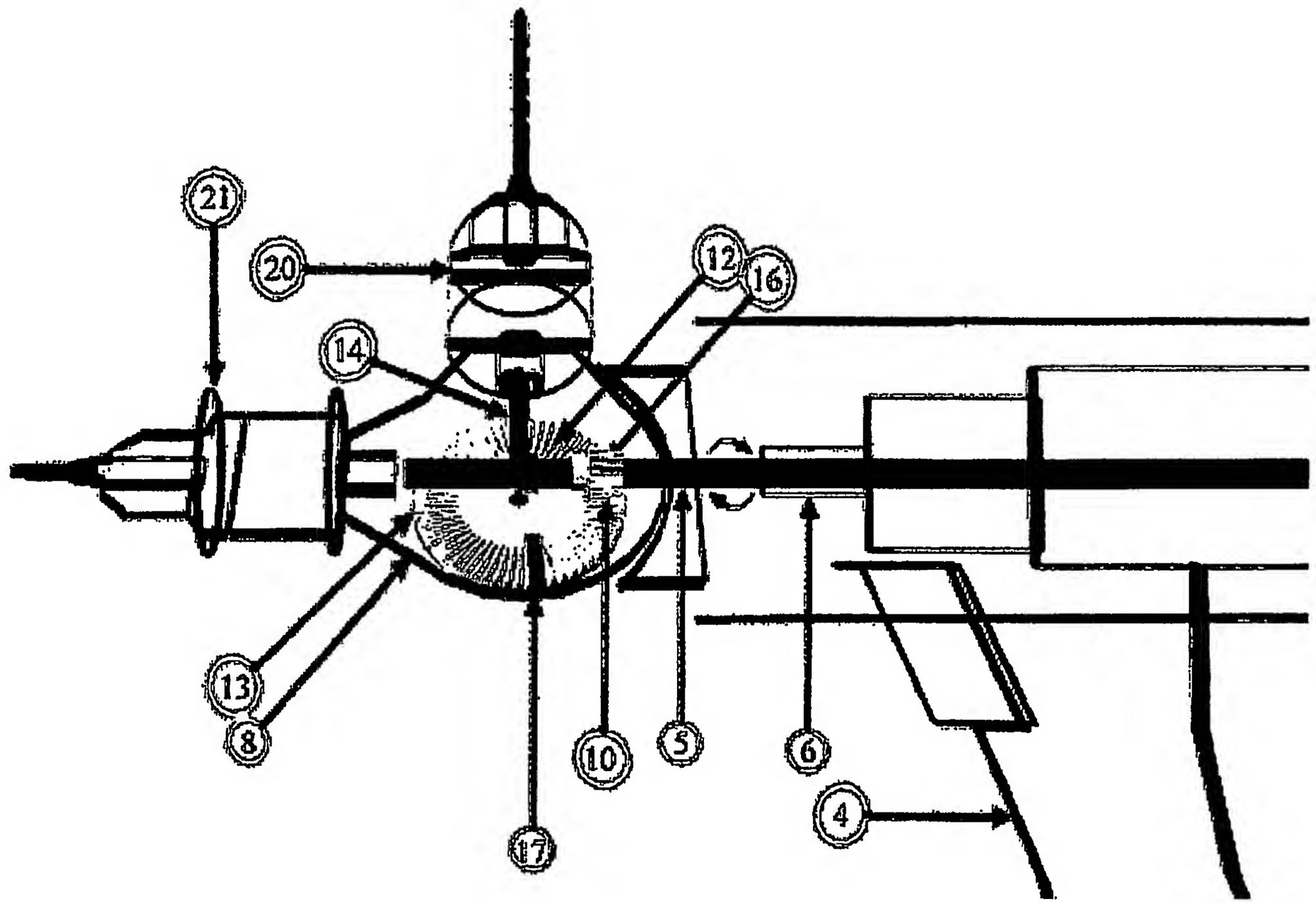

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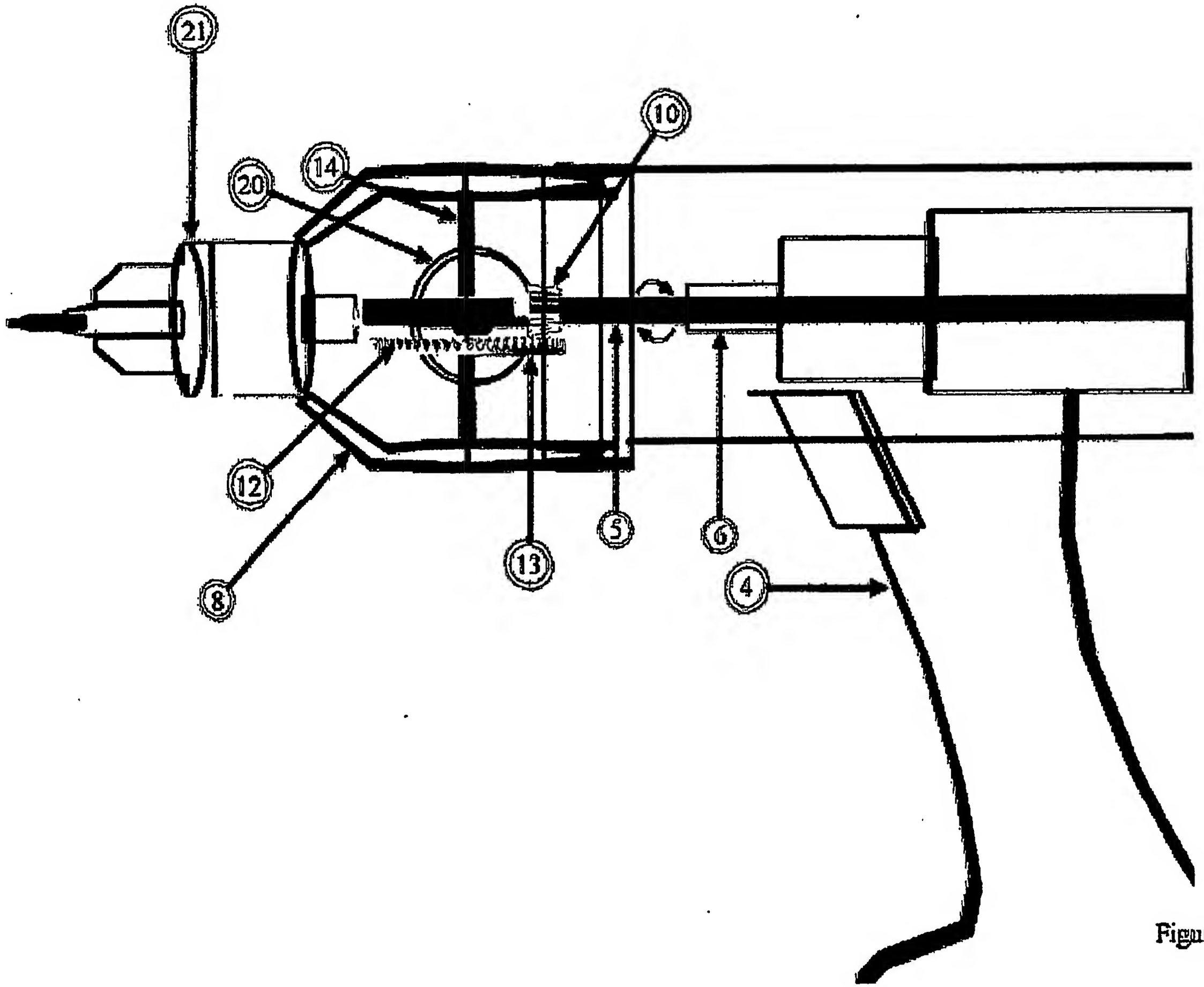

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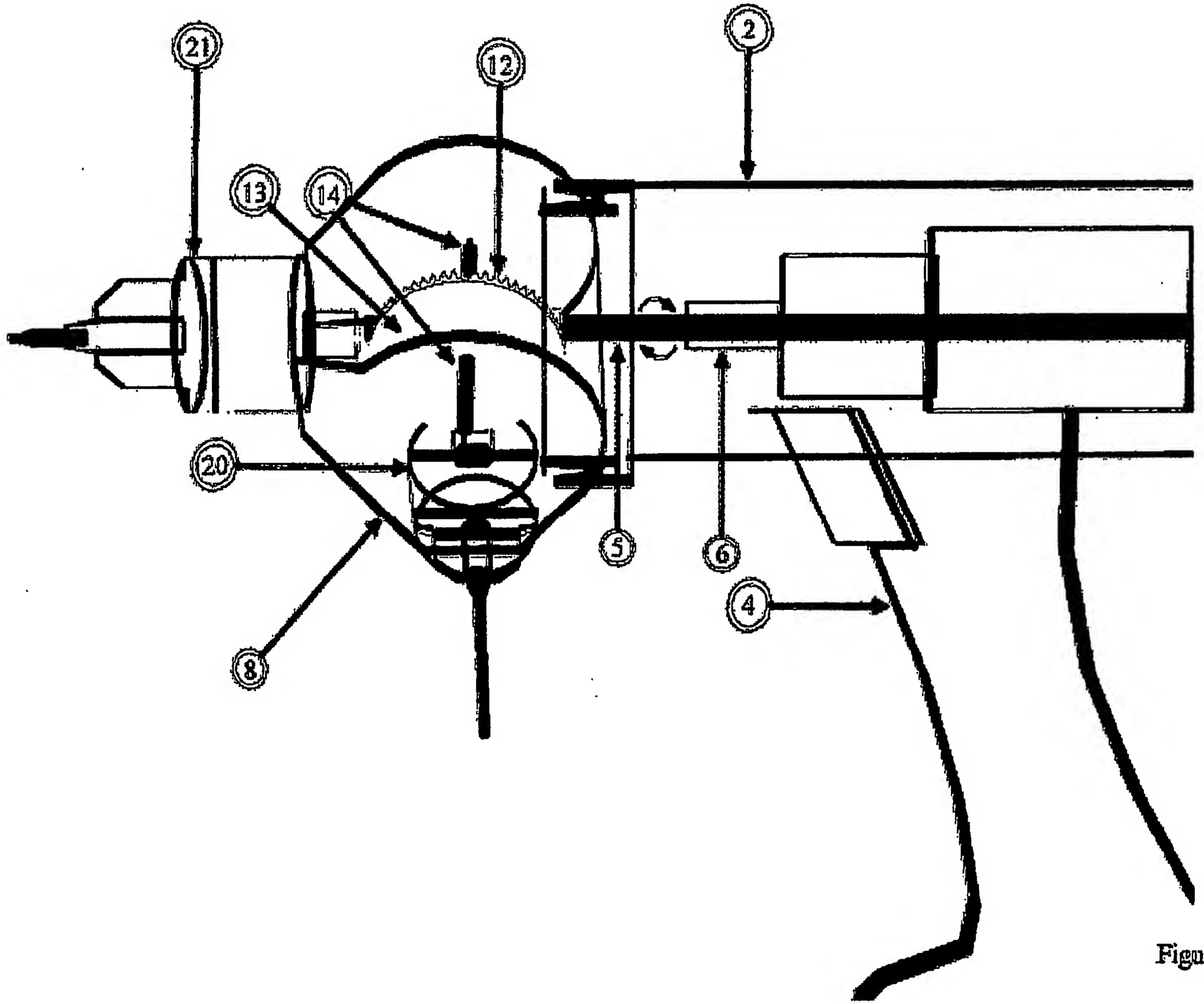

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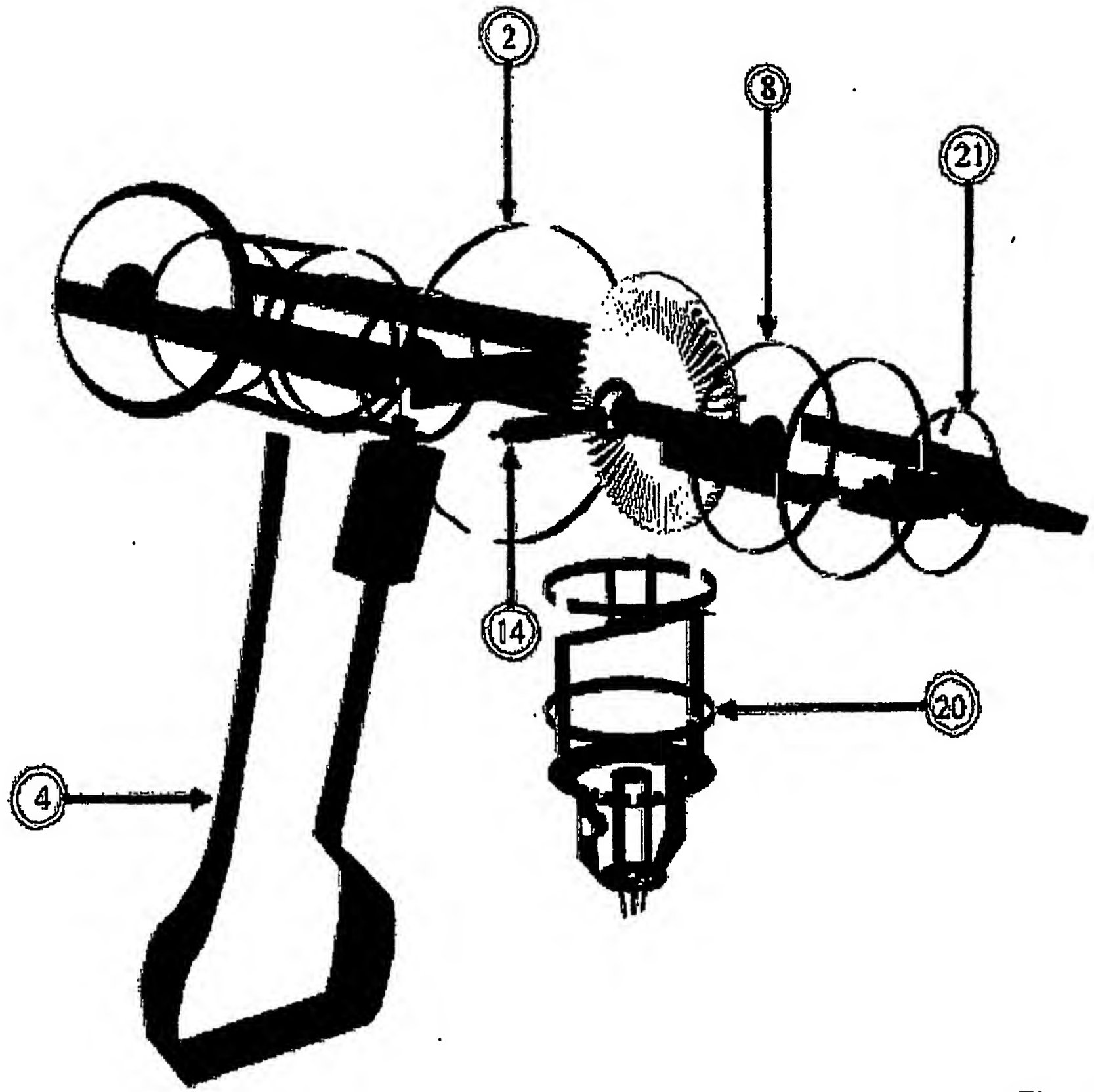
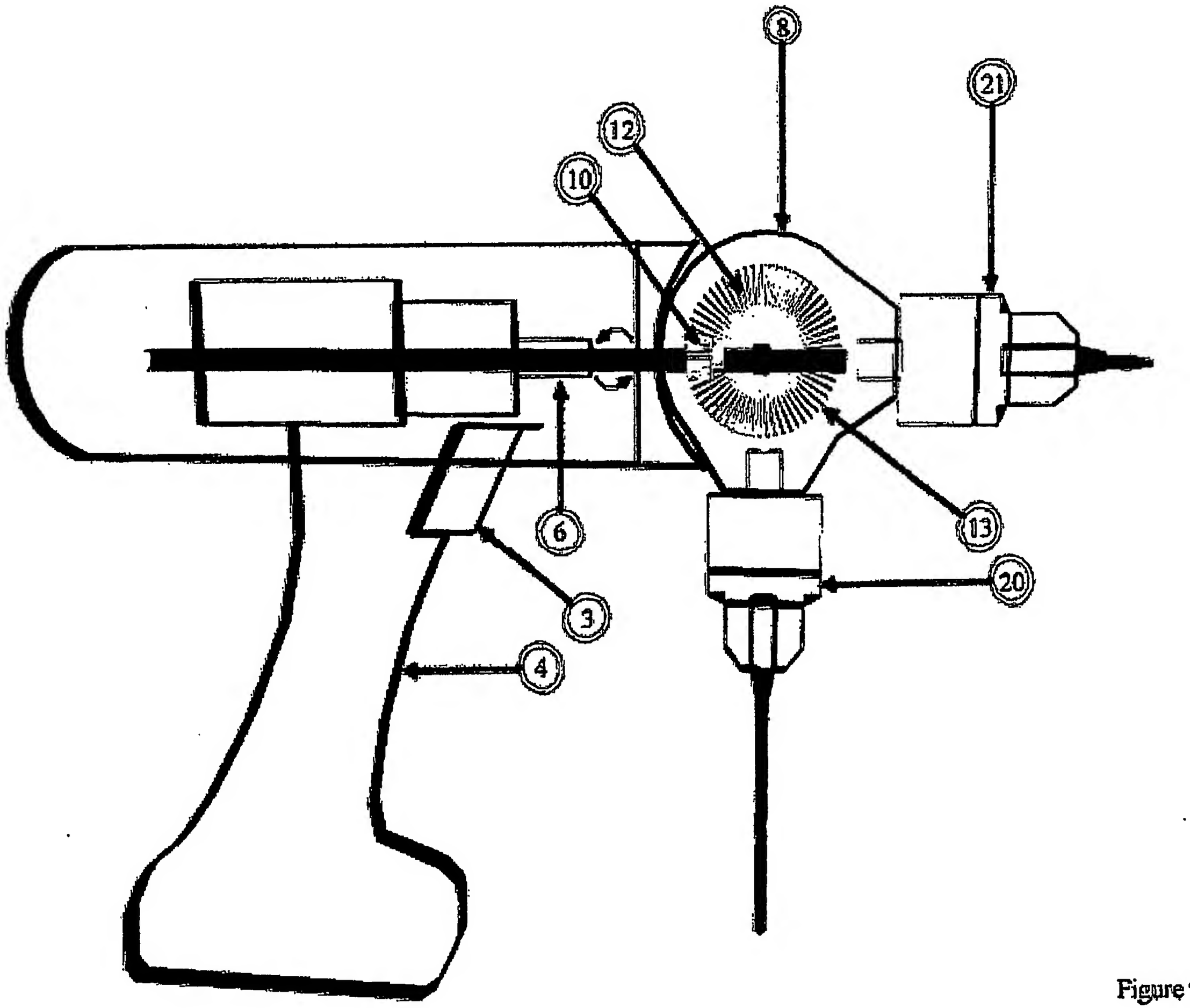


Figure 8



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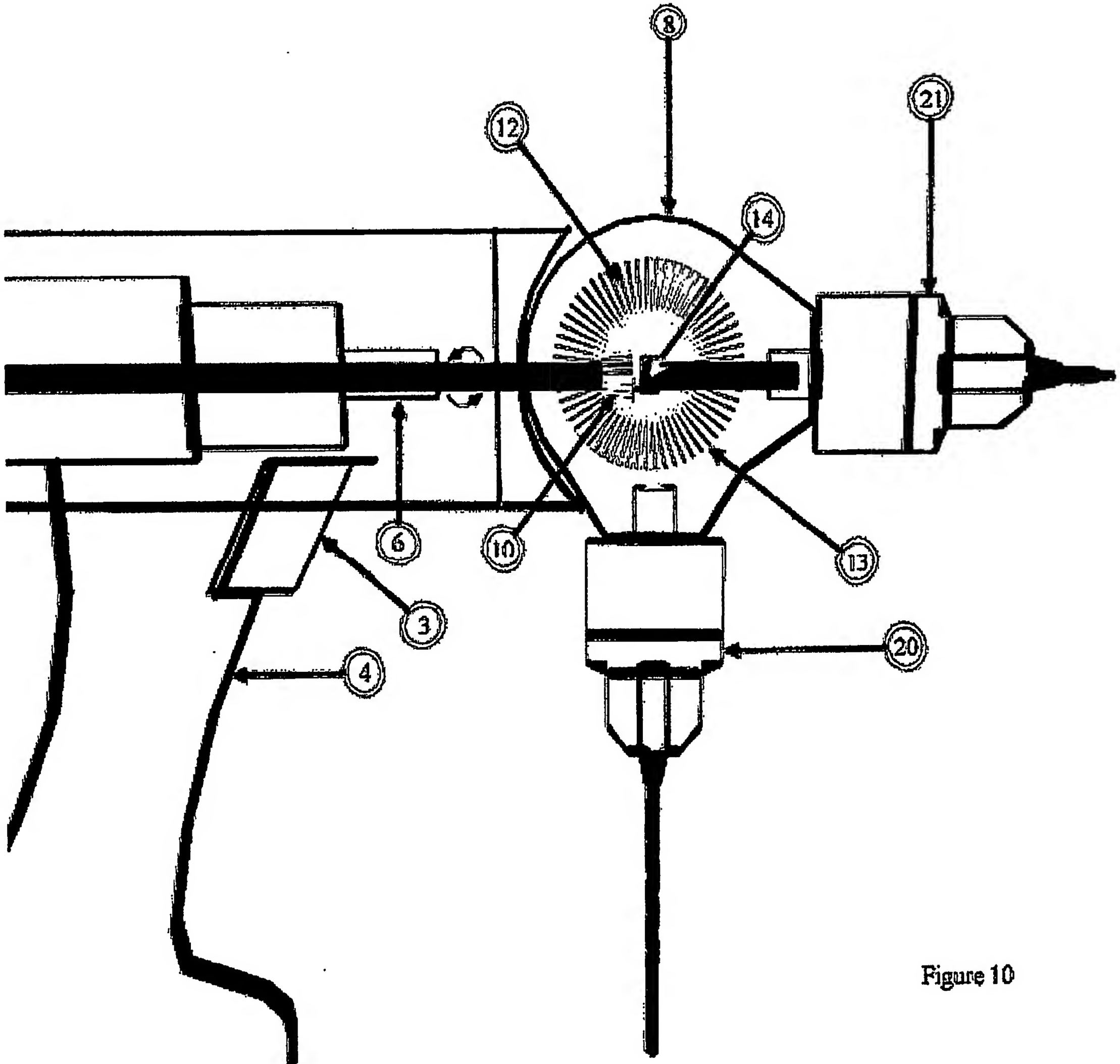


Figure 10

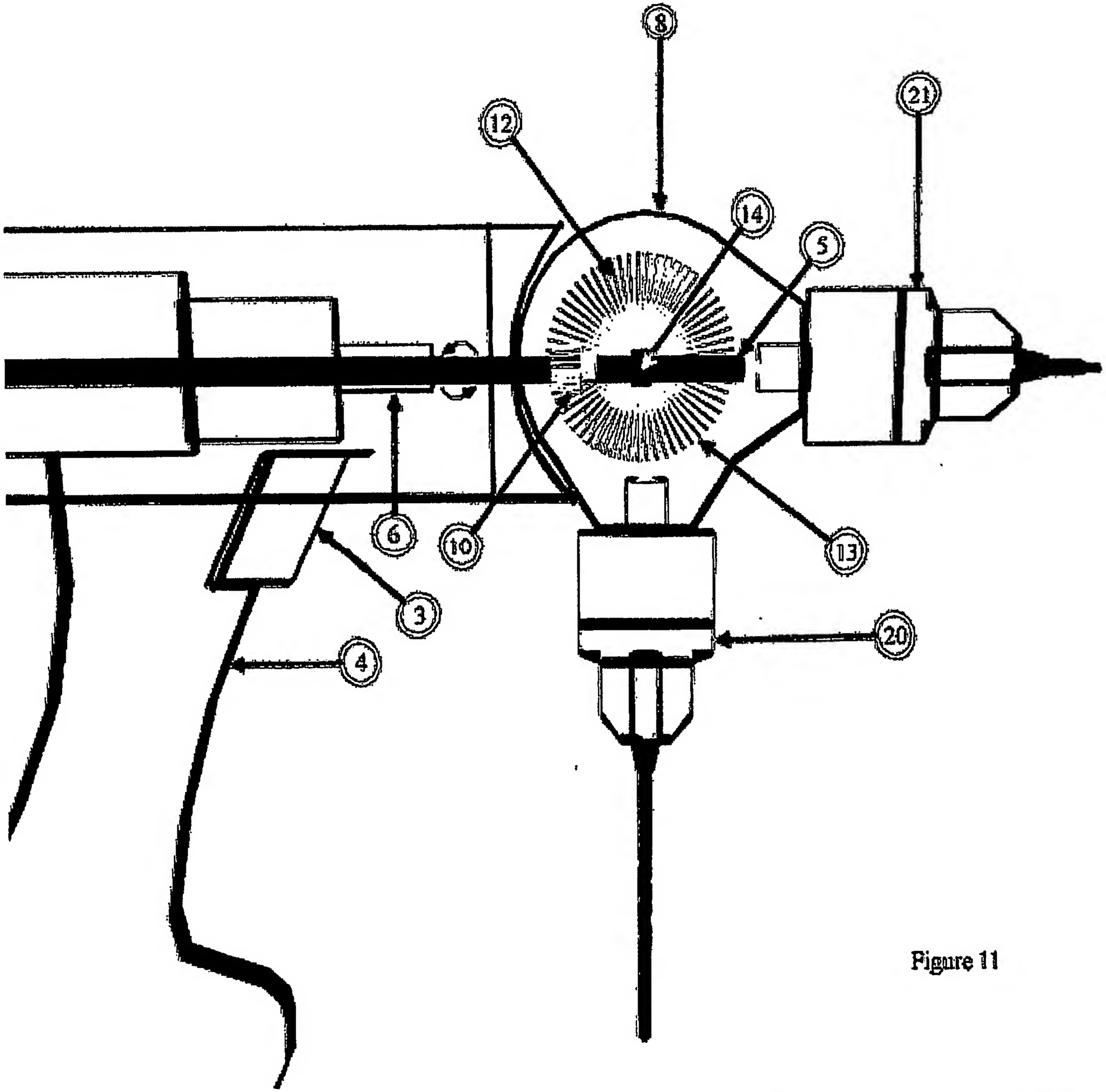


Figure 11

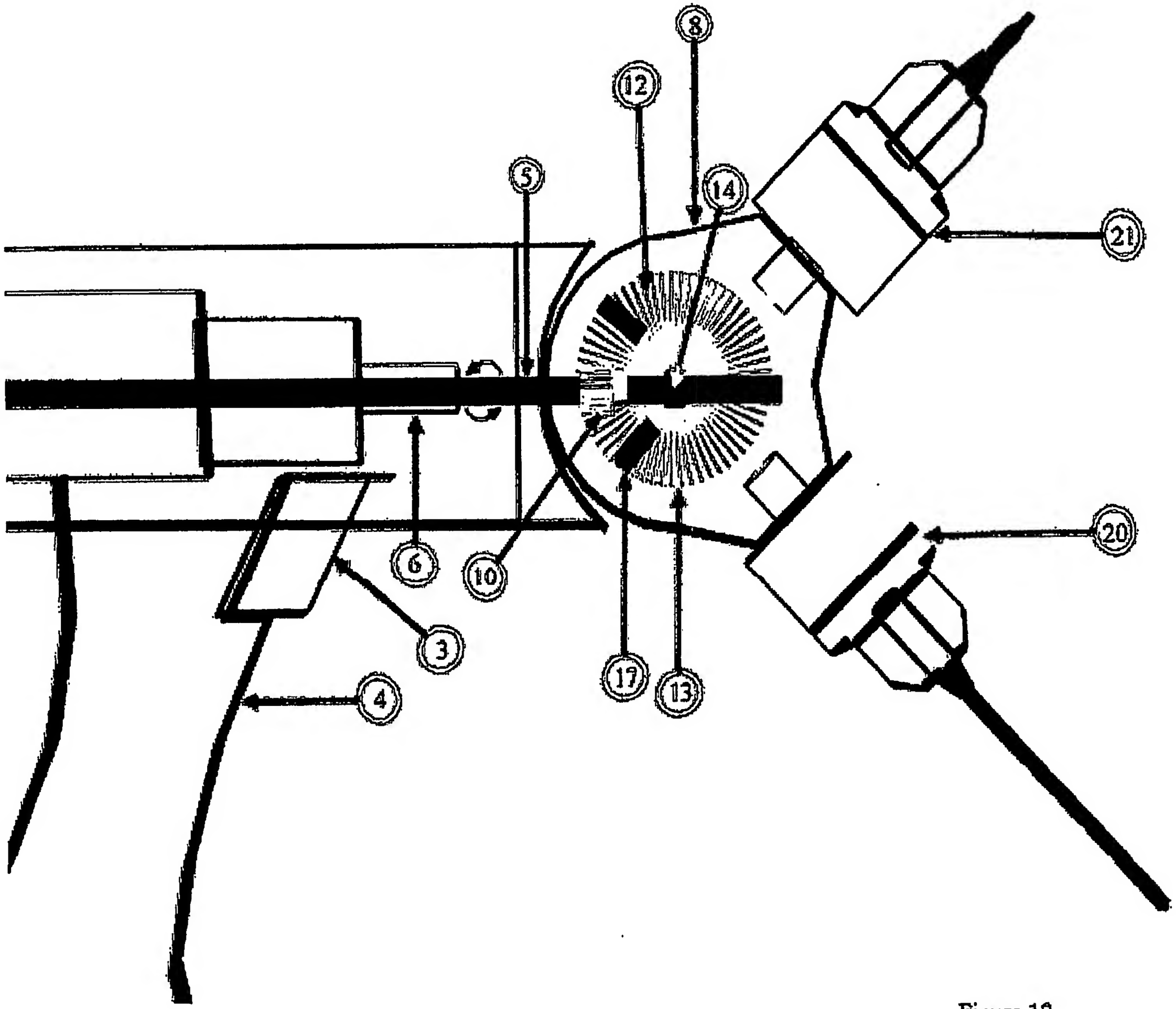


Figure 12

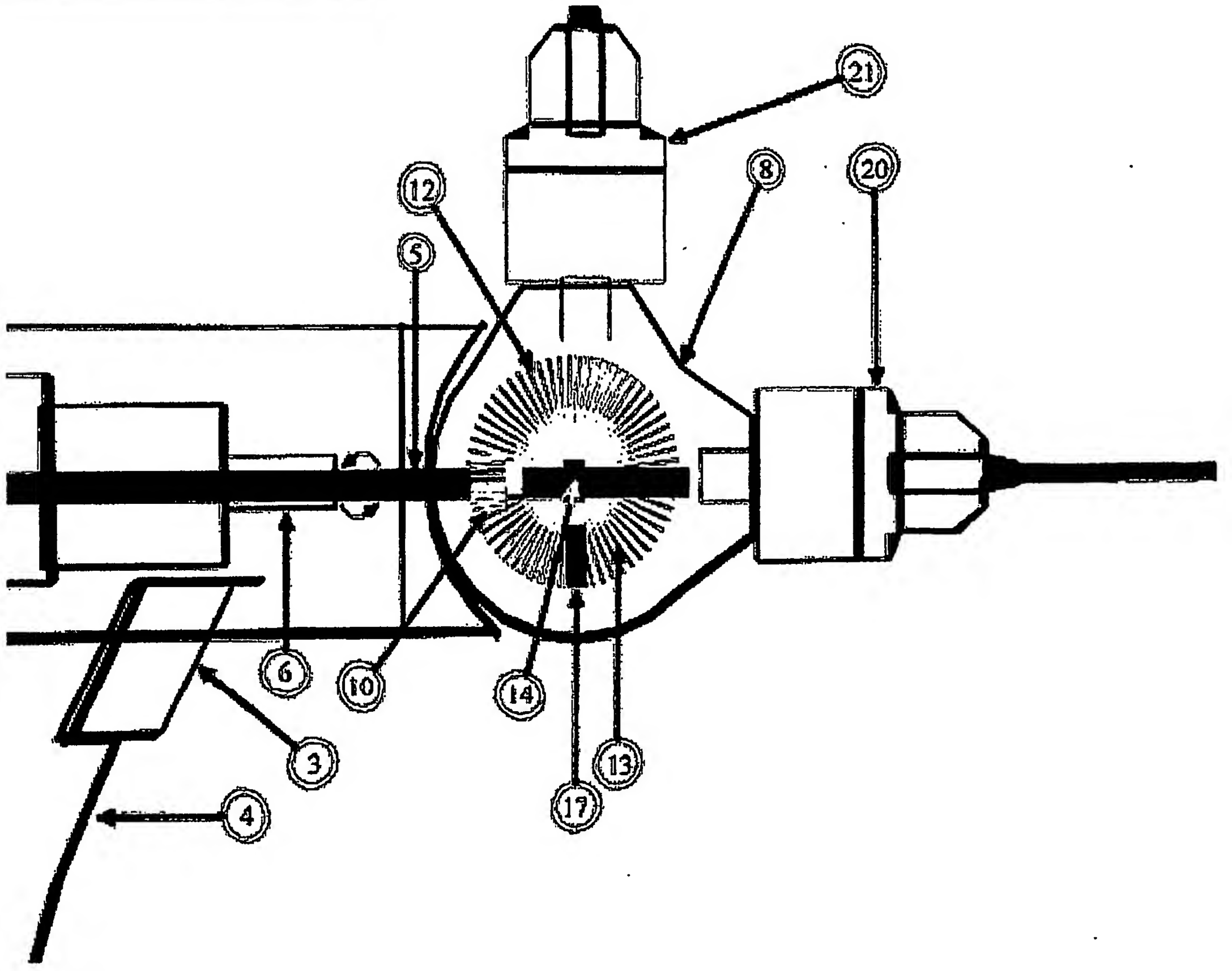


Figure 13

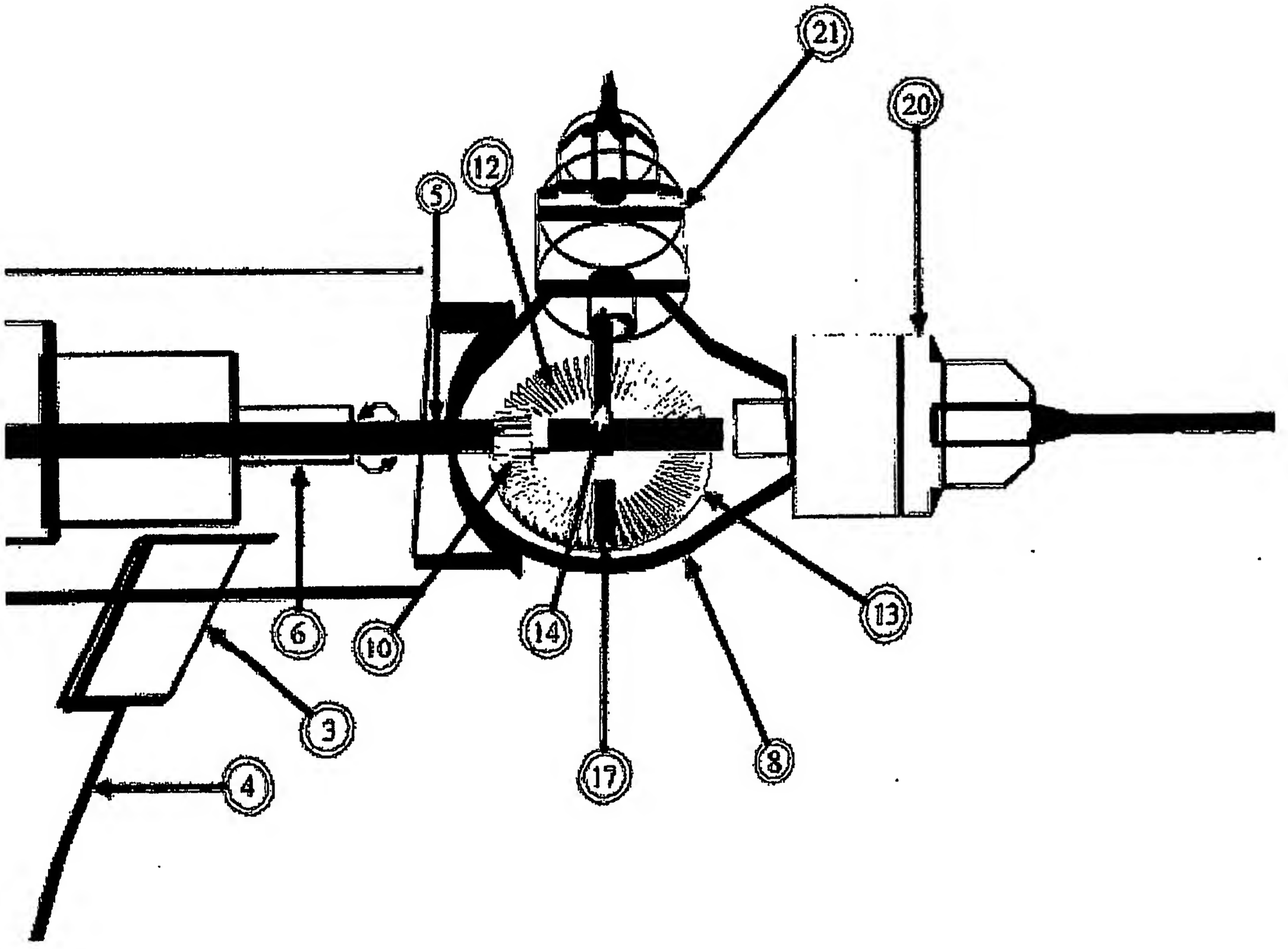
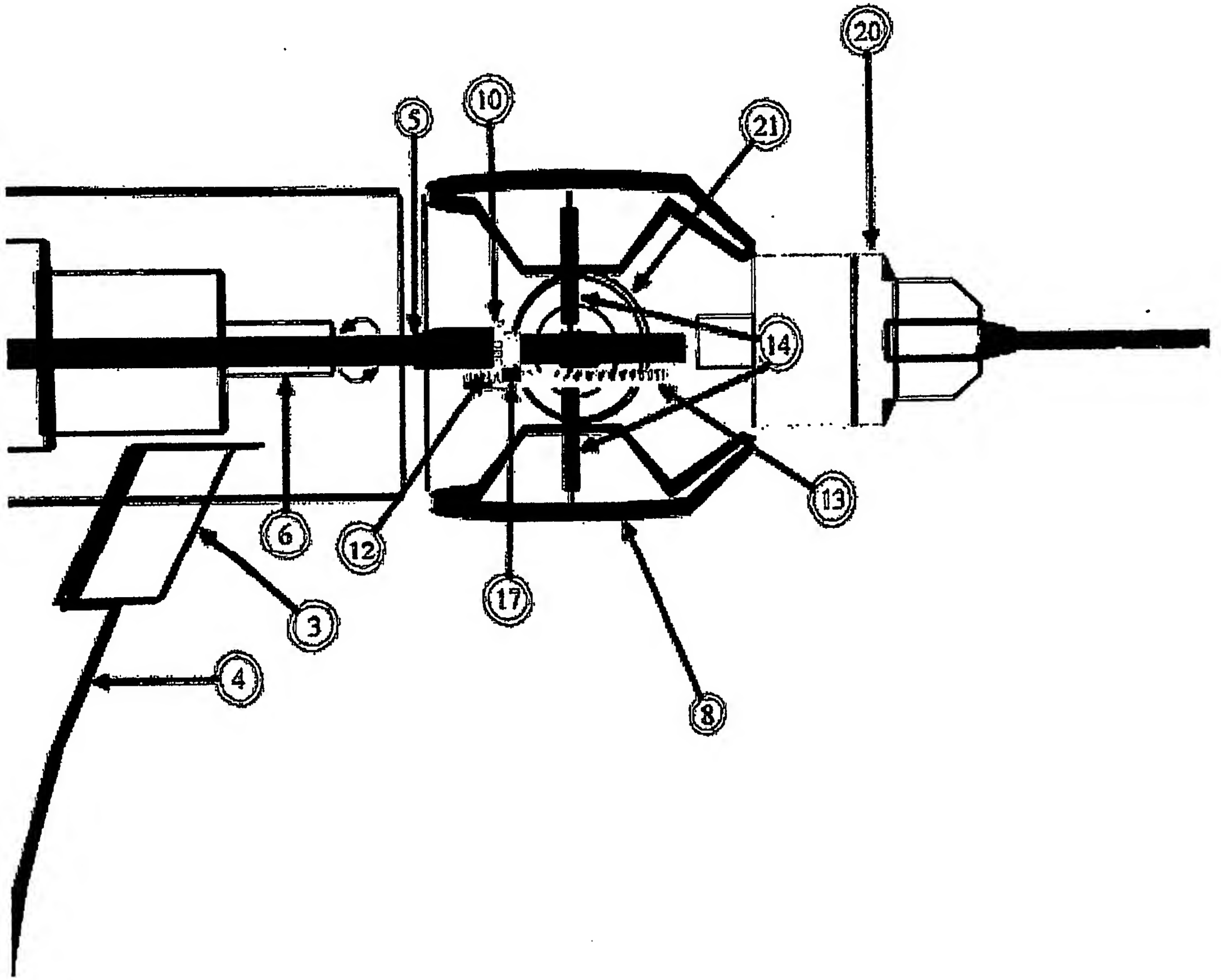


Figure 14



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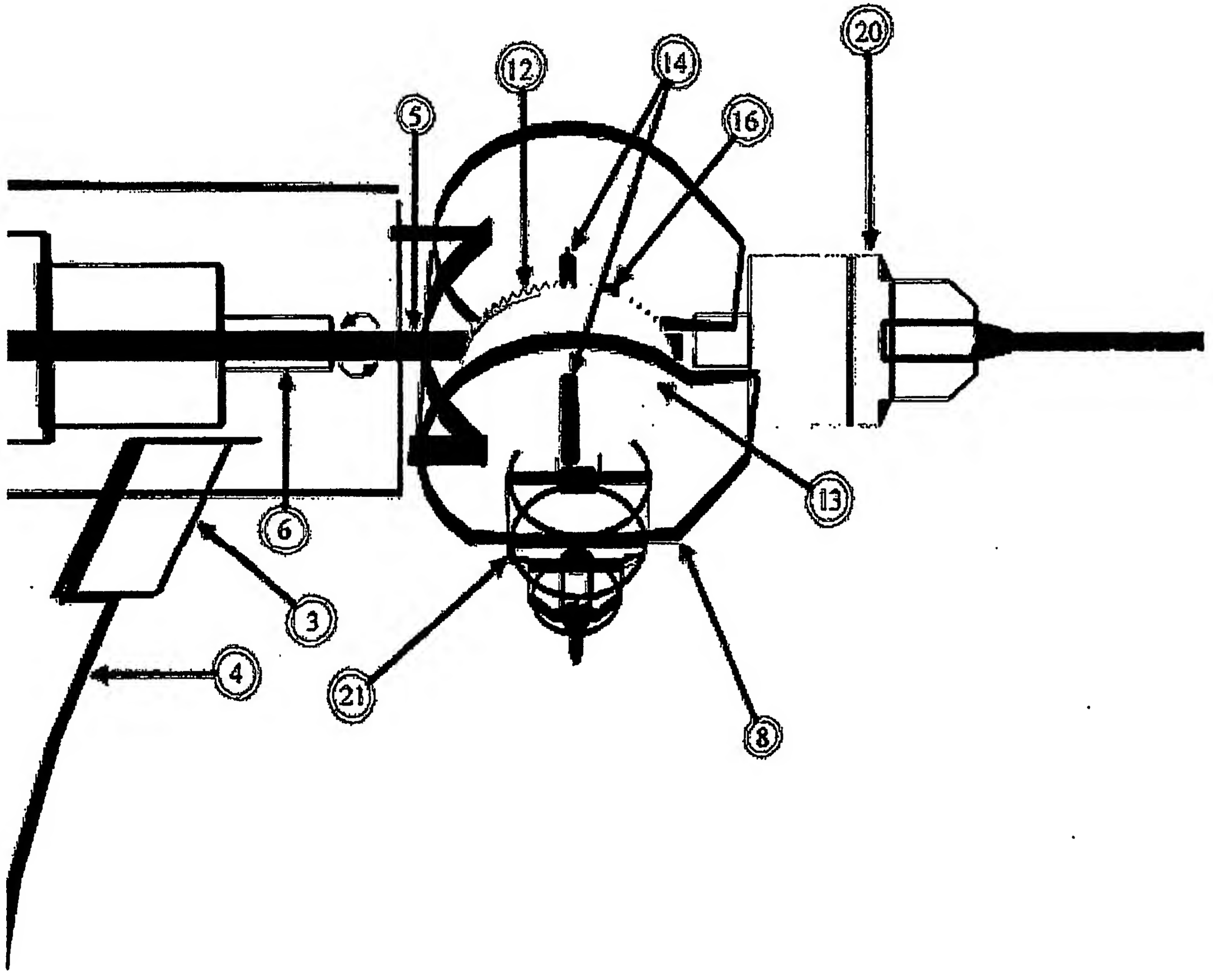

Figure 16

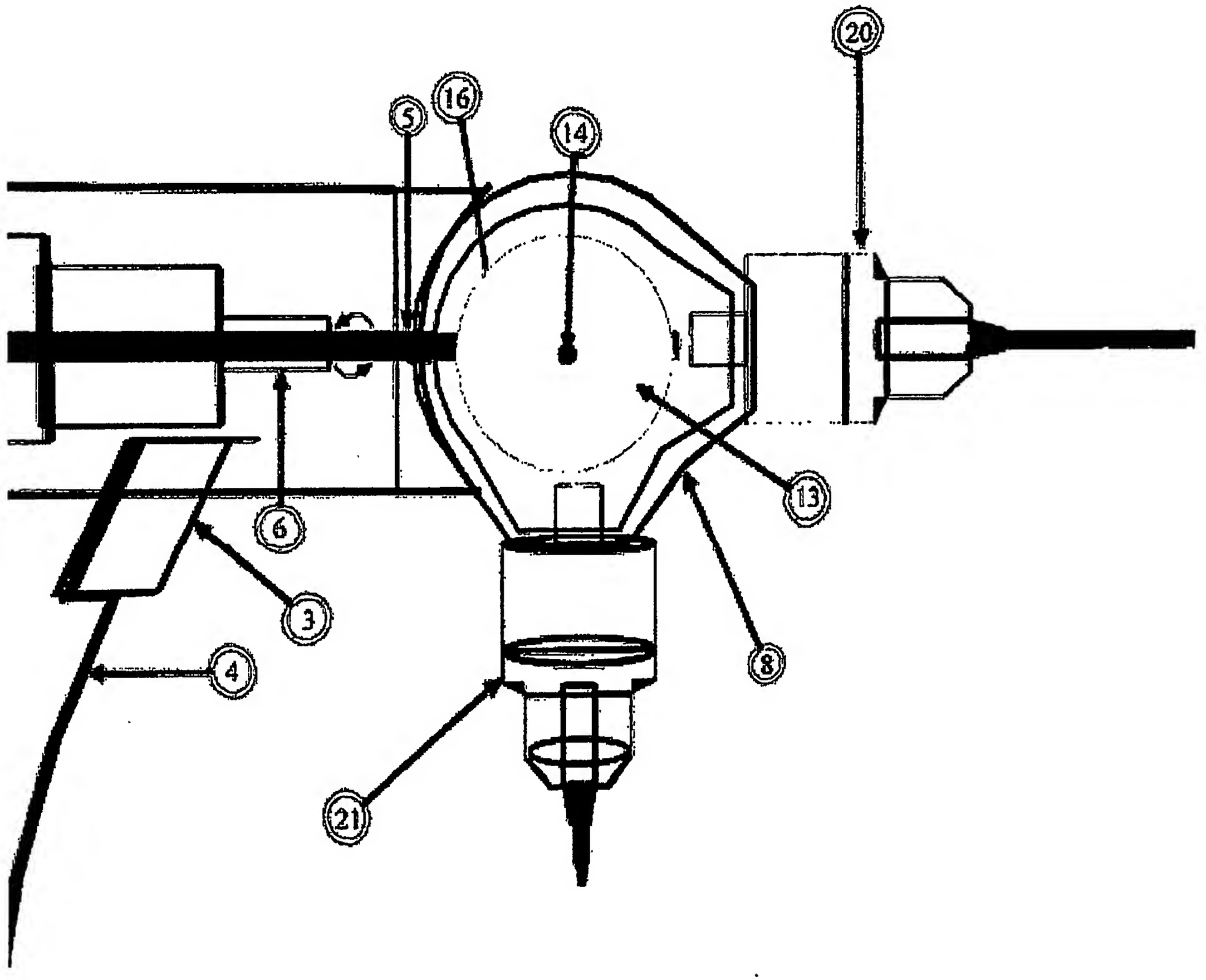

Figure 17

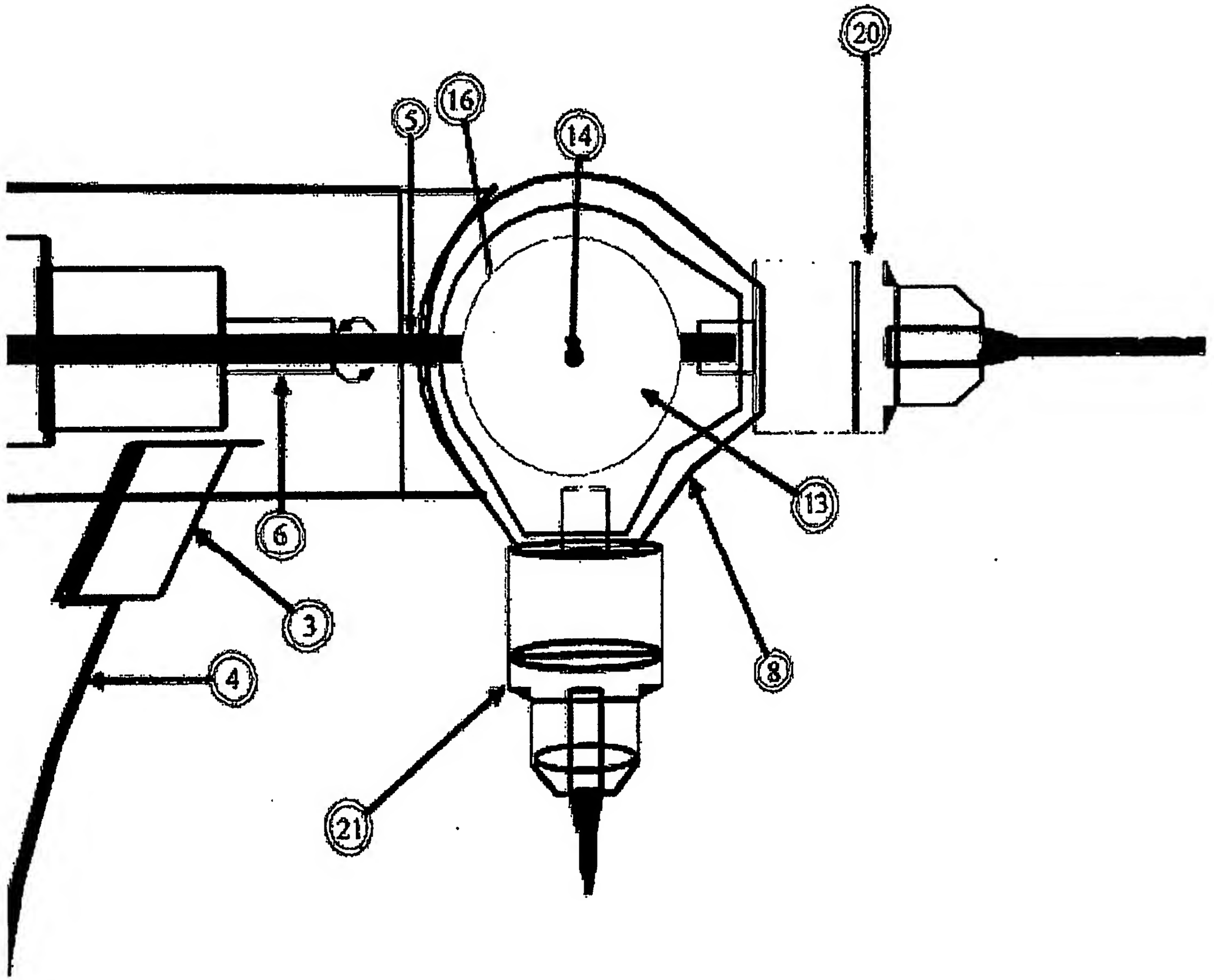

Figure 18